

MAGNETIC RECORDING HEAD PROTECTION

RELATED APPLICATIONS

The present application claims priority under 35 U.S.C. § 119(e) from U.S.

- 5 Provisional Patent Application Serial No. 60/239,158 filed October 10, 2000, which
provisional application is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to methods of protecting magnetic recording heads.

- 10 More particularly, the present invention relates to methods of protecting magnetic
recording heads during assembly and rework processes.

BACKGROUND OF THE INVENTION

- 15 Magnetic hard disk drives are useful devices for storing significant amounts of
data and quickly accessing that data. Data is read from a hard disk by an electro-
magnetic process in which magnetic domains resident in the disk are converted into
electrical signals by a magnetic head or transducer positioned above the surface of a disk
as the disk rapidly rotates about an axis. Similarly, data is written to a disk by the same
or a different head or transducer which converts electrical signals into a magnetic field
20 which magnetizes discrete locations of the data layer of the magnetic disk. Generally
speaking, reversing the direction of the magnetic field produced by the transducer
reverses the polarity of the magnetic domain of the disk.

In a conventional hard disk drive, the transducer or transducers for reading and writing data are positioned at the rear end of a slider which either rides in contact with the surface of the disk or flies above, but in close proximity to, the surface of the disk. The slider is connected to a load beam which, in turn, is connected to an actuator arm. The actuator arm pivots about a shaft under the influence of a voice coil motor in order to position the transducer, or read/write element, relative to the tracks of data resident on the disk. The local beam typically biases the transducer to a position in contact with the surface of the disk when the disk drive is turned off.

Transducers are delicate structures and are susceptible to corrosion. As a result, during the assembly process, a protective overcoat is applied to heads and sliders. The overcoat protects the slider from corrosion before final assembly while the head is exposed to the atmosphere. When assembly is completed, the actuator assemblies and disks are contained in a sealed housing which reduces or substantially eliminates the likelihood of corrosion of the transducers. Various filter elements are contained in the disk housing to maintain the relative purity of that environment.

Once the drive is fully assembled, it is subjected to numerous tests for purposes of quality control, and perhaps calibration. As part of these procedures, the drive is started and stopped numerous times, causing the slider to slide across the disk surface and the protective overcoat to be worn away. With the overcoat removed from the transducer(s), read and write operations can also be tested. Assuming all tests are successful, the drive is packaged and sold.

In those instances when the drive fails one or more tests, the problems may be addressed by reworking or repairing the drive. The rework process requires access to the

drive and may result in exposure of the drive components to the atmosphere or other corrosive elements. The disassembly and rework process may also expose the unprotected transducers or magnetic elements of the heads to corrosion from exposure to the atmosphere. If the exposure to corrosive environmental elements is not minimized, the expected life and future operation of the disk drive will likely be adversely affected to the chagrin of the customer and manufacturer.

SUMMARY OF THE INVENTION

The invention involves the use of a protective coating or film that is applied to the head element, or transducer, of a disk drive for the purpose of protecting the head element from corrosion. The heads of a disk drive are typically overcoated with a carbon film during their original manufacture to protect the read/write elements from corrosion. However, for whatever reason, the head element may be susceptible to corrosion and in this case the coating of this invention can be applied to protect the head element from corrosion. A specific case where the head(s) are susceptible to corrosion is reworking a disk drive or a head stack assembly (HSA). To rework a disk drive the top cover is removed. HSAs may be reworked prior to installation in a drive. The disk drive or HSA may have subsequently undergone testing or use, thereby at least partially or fully removing the original protective coating. The head element of the slider is the location of the sensitive thin metal layers or films which conduct read/write operations and which are subject to corrosion from exposure to the ambient environment.

Disk drives that have been identified as requiring rework for any number of reasons must be opened to access the contents of the disk drive. Upon opening the disk